Economic Viability Tool

User's Guide

Valid for V.1.7 of the Economic Viability Tool

Change Control

Date	Change Details	Owner / Requester
1/24/2005	Version 1.0 - Initial Version	Jason Wendt
2/7/2005	Version 1.1 – Updated OMB Discount Rate Guidance	Jason Wendt
2/8/2005	Version 1.3 – match version with E-V Tool, includes interpolation	Jason Wendt
5/3/2005	Version 1.4 – Update description of discount rate calculation	Jason Wendt
6/2/2205	Version 1.5 – Updated Metrics descriptions	Jason Wendt
2/6/2006	Version 1.7 – Updated discount rates, added glossary	Jason Wendt

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1 Overview

1.1 Background

The Economic Viability (EV) tool collects the projected financial costs and benefits of an IT investment. The tool calculates several measures of financial return from these inputs. The EV tool utilizes summary information provided by the user. The necessary inputs would typically be available in a cost-benefit analysis or other studies regarding the financial impact of the investment. It is recommended that users have relevant studies or cost-benefit analysis available when completing the EV tool.

1.2 Sources of Help

The EV tool's Instructions tab provides guidance on completing the tool. In-depth guidance can be found within this document. Additional information sources are identified where appropriate.

The latest copy of the EV tool can be downloaded from the following URL: http://www.teracore.com/ev.

Please address any questions regarding the EV tool to EV-help@teracore.com.

1.3 Structure

System financial data is entered in the User Input tab, which is organized into five sections:

1. Parameters
2. Program / System Improvement Costs
3. Status Quo Costs
4. Phase Out Costs
5. Other Cost Savings

Detailed explanations are provided for each of these sections below. Please print this document and reference it as you complete the tool.

2 User Input (Parameters)

2.1 Overview

The parameters section provides basic information used to identify the system and calculate various financial metrics. A reproduction of the parameter section from the tool appears below.

Parameters	
Current Fiscal Year (YYYY)	2005
FOC Year (YYYY)	Select One
Discount Rate (X.XXX%)	3.700%
System Acronym	

2.2 Parameters

Three parameters must be entered (the Discount Rate is calculated automatically):

Field	Description
Current Fiscal Year (YYYY)	The current fiscal year in YYYY format - Select the correct year from the drop down.
FOC Year (YYYY)	The year (in YYYY format) the system and/or the investment will achieve Fully Operational Capability (FOC) - Select the correct year from the drop down.
Discount rate (X.XXX%)	The nominal discount rate to be used for the financial analysis (Section 2.3 describes its calculation in detail) – NO ENTRY NECESSARY
System acronym	The system's acronym

2.3 Determining a Discount Rate

The EV Tool calculates the appropriate discount rate based on the years for which data is entered. The remainder of this section describes the calculation of the discount rate and provides an example.

The Office of Management and Budget (OMB) releases the nominal and real discount rates for use in financial analysis in February of each year. These discount rates are documented in Circular A-94, which is available online at http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html. Nominal discount rates are used in the Economic Viability tool.

The nominal discount rates as of February 2006 are:

Years:	3	5	7	10	20	30
Rate:	4.7%	4.8%	4.9%	5.0%	5.3%	5.2%

In the table above, "years" refers to the number of periods for which the investment's cash flow should be discounted. For example, if the current fiscal year is 2005 and the cash flows end in FY 2009, then five years should be discounted using the 4.8% discount rate. The first year counted is always the current fiscal year, even if the first cash flows are in future fiscal years.

There will be instances when the number of periods to be discounted is not specified in the OMB table provided, e.g., the cash flows associated with an investment may encompass eight (8) years. In those instances, OMB recommends that linear interpolation should be used to calculate the applicable discount rate. For periods shorter than 3 years, the 3-year rate (3.7%) should be used. For periods longer than 30 years, the 30-year rate (5.2%) should be used.

A linear interpolation formula that could be used to calculate inter-period discount rates is:

[Rate1 * {(Diff – (Life – Year1)) / Diff}] + [Rate2 * {(Diff – (Year2 – Life)) / Diff}]

For example, you would use the discount rates associated with seven and ten years to calculate the discount rate for an investment whose cash flows span eight years.

Variable	Definition	Example
Rate1	The discount rate associated with the preceding period	4.9%
Year1	The period preceding this period	7
Rate2	The discount rate associated with the subsequent period	5.0%
Year2	The period following this period	10
Diff	The number of periods between the preceding and following period	10 – 7 = 3
Life	The number of periods for the investment's cash flows	8

In this scenario, the formula would yield a discount rate for eight periods of 4.47%:

[(4.9%) * {(3 – (8 – 7)) / 3}] + [(5.0%) * {(3 – (10 – 8)) / 3}] = (4.9% * (2 / 3)) + (5.0% * (1 / 3)) = 4.93%

3 User Input

3.1 Overview

Enter the system's financial data in Sections A through D of the User Input tab. A screenshot of the user input section appears below.

Then Year $ in Millions	*SUNK*	2005	2006	2007	2008	2009	2010	2011
A - PROGRAM / SYSTEM IMPROVEMENT COST (do not include any status quo costs)**:**								
A1 - Investment (Dev/Mod)	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000
A2 - Operations & Support	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000
Total	**$0.000**	**$0.000**	**$0.000**	**$0.000**	**$0.000**	**$0.000**	**$0.000**	**$0.000**
B - STATUS QUO COSTS (total assuming NO alternative program/system improvement outlined in section "A"):								
B1 - Investment (Dev/Mod)		$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000
B2 - Operations & Support		$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000
Total		**$0.000**	**$0.000**	**$0.000**	**$0.000**	**$0.000**	**$0.000**	**$0.000**
C - PHASE OUT COSTS (WITH alternative Program/System Improvement outlined in section "A"):								
C1 - Investment (Dev/Mod)		$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000
C2 - Operations & Support		$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000
Total		**$0.000**	**$0.000**	**$0.000**	**$0.000**	**$0.000**	**$0.000**	**$0.000**
D - OTHER COST SAVINGS (recoverable cost savings benefits not related to status quo cost reductions):								
Other Benefits		$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000

Systems classified as New Starts should provide Investment (Dev/Mod) and Operations and Support (O&S) cost data through ten fiscal years beyond FOC (see Section 3.2.1 for definitions of "New Starts" vs. "Enhancements").

The EV tool uses data entered in sections A through D to calculate several financial performance metrics. Two analyses are performed:

1. **Without Other Cost Savings** - the system's financial performance based on the lower O&S costs derived through the implementation of a preferred solution that replaces a status quo system
2. **With Other Cost Savings** - the system's financial performance based on the lower O&S costs and other (hard dollar) cost savings achieved through the implementation of a preferred solution that replaces a status quo system

3.2 Definitions

Investment (Dev/Mod) and Operations and Support (O&S) costs should be entered in the EV tool. The definitions for each term are provided below to serve as guidance when completing the EV tool.

3.2.1 Investment (Dev/Mod)

Development/Modernization applies to existing system upgrades, refreshes, or modernizations; new systems undergoing spiral or incremental development; and single, comprehensive development efforts. Both new starts and enhancements to existing systems as defined below should be included.

> **NEW STARTS:** All costs related to new starts, initiatives, programs, or systems; or similar IT efforts or systems under development, are categorized as Development/Modernization. This includes the use of Other Procurement, Defense Working Capital Funds, Research Development Test and Evaluation, and even Operations and Maintenance funds for a "new start." It also includes costs associated with the Program Office personnel, software and hardware purchases, system configuration, development, the

various compliance and system testing, and changes required to existing systems to support the new system.

ENHANCEMENTS: Any change or modification to an existing system, program, or initiative that results in improved capability or performance of the baseline activity or expansion of existing capabilities to new users are categorized as Development/Modernization. "Improved capability or performance of the baseline activity" means that the change or modification will add new functionality or enhance existing functionality and/or performance (e.g., improved system response times achieved by CPU or memory upgrades or upgrades to network throughput (T-1 to T-3, 10Mb routers to 100Mb routers, etc.)). Technology refreshment of software and/or hardware that is no longer supported by the manufacturer because of obsolescence is included, as is upgrade of a system from client/server to web environment.

Expenditures for the following are **not** to be categorized as Development/Modernization:

1. Activities to support the day-to-day operations of a system, including corrective software maintenance (bug fixes), are not categorized as Development/Modernization.
2. Technology refreshment simply to provide network or infrastructure upgrades that is unrelated to a specific system or application. For example, upgrading from copper to fiber cable, or from CRT monitors to flat panel monitors (LCD plasma, etc.), would be considered maintenance or sustainment.
3. Improved capability or performance, achieved as a by-product of the replacement of broken IT equipment required to continue an operation at the current service levels, is not categorized as Development/Modernization.

3.2.2 Operations and Support (O&S)

Operations and Support (O&S) includes all costs to sustain the IT system after it has been released to production. It includes the day to day cost to manage, support, and maintain the hardware and software and to sustain system operations. These costs include:

1. Personnel whose duties relate to the general management and operations of the system to include personnel in program management/system offices providing such services;
2. Maintenance of existing application or infrastructure program;
3. Corrective software maintenance, including all efforts to diagnose and correct system errors (i.e. processing or performance errors) in a system;
4. Replacement of broken IT equipment needed to continue operations of a system at the current service level; and all other related costs not identified as development/modernization.

3.3 Data Requirements

Up to four types of cost data should be entered in the EV tool's User Input tab. All data should be entered in current (then year) dollars.

3.3.1 Section A: Program / System Improvement Cost

All Investment (Dev/Mod) and O&S costs associated with the preferred solution or system change request (SCR) should be entered in Section A. The sunk costs column should contain the spending that has already occurred (sunk costs do not affect the metrics calculations).

- Investment (Dev/MOD) costs are entered on line A1.
- O&S costs are entered on line A2. For SCRs, only those O&S costs directly related to the SCR should be entered in A2.

3.3.2 Section B: Status Quo Cost

Investment (Dev/Mod) and O&S costs associated with the Status Quo system – the system being replaced by the preferred solution or enhanced by the SCR – should be entered in Section B. Cost data entered in this section is predicated on the assumption that the preferred solution/SCR will not be implemented.

- Investment (Dev/MOD) costs are entered on line B1.
- O&S costs are entered on line B2.

3.3.3 Section C: Phase Out Cost

Investment (Dev/Mod) and O&S costs associated with phasing in the preferred solution or SCR and the resulting impact upon Status Quo costs should be entered in Section C.

The Phase Out Costs section captures the costs of maintaining legacy systems while the alternative is developed and implemented. Many new systems are phased in over time. The costs to maintain outgoing systems during the phase in process are captured here. Any disposal costs should also be included in the Phase Out section. In general, there should not be any phase out costs once the system reaches FOC.

- Investment (Dev/MOD) costs are entered on line C1.
- O&S costs are entered on line C2.

3.3.4 Section D: Other Cost Savings

Recoverable cost savings associated with the implementation of the preferred solution/SCR are entered in Section D. The value of productivity improvements or cost avoidance is not to be entered in Section D.

Detailed information delineating the cost savings should be entered in the text box below Section D. Information regarding productivity improvements or cost avoidance can be noted in the text box as well.

3.4 Usage Considerations

3.4.1 SCRs

If an SCR will not increase or decrease the costs associated with a Status Quo system, do not enter data in sections B and C. If implementing the SCR will affect the Status Quo system's costs, then enter the system's current costs in section B and the new costs resulting from the implementation of the SCR in section C. If multiple SCRs are being requested simultaneously, one EV Tool may be completed aggregating all costs and benefits for the SCRs. Be sure to site the source of the benefits in the comments section.

3.4.2 Cost Savings

When completing section D, keep in mind that the operating assumption is that any costs entered in this section can be recovered through the budgetary process.

Possible cost savings include headcount reductions and terminated system maintenance contracts. Productivity improvements or operational efficiencies quantified in terms of FTEs (full time equivalents) should not be entered in this section unless those FTE positions are going to be eliminated in the fiscal year detailed.

4 Metrics

4.1 Overview

The financial performance metrics the EV tool calculates are reported on the tool's Domain View and PA&E View tabs. No data entry is required in this section; data listed is for information purposes only. The Domain View metrics are seen below. The PA&E View does not include the BCR metric.

As of Fiscal Year 2005	Without Other Benefits	With Other Benefits
Net Present Value (NPV)	$0.000	$0.000
Return on Investment (ROI)	No ROI	No ROI
Benefit Cost Ratio (BCR)	No BCR	No BCR
Break-Even (discounted)	None	None
Break-Even (non-discounted)	None	None

4.2 Views

The Domain View and PA&E View tabs display detailed calculations regarding the financial return of the investment. While the views calculate the same metrics (except for the BCR which is seen only in the domain view), they do so from two different perspectives. The Domain view takes the perspective of the program. That is, decreases in expenditure are displayed as positive dollars. Conversely, the PA&E view takes the perspective of the budget itself. That is, decreases in expenditure are displayed as negative dollars. It should be noted, the metrics listed in the dashboard sections at the top of both pages will be identical (section 4.3 explains each metric in greater depth). However, the opposing sign conventions in the intermediate steps will exist. It is recommended that users refer only to the metrics at the top of either page. If greater detail is needed, focus on one view or the other.

4.3 Financial Performance Metrics

Five financial performance metrics are calculated:

1. Net present value (NPV)
2. Return on investment (ROI)
3. Benefit Cost Ratio (BCR)
4. Break-even (discounted)
5. Break-even (non-discounted)

Each performance metric measures the financial return of the proposed system differently. Each has its own drawbacks and limitations described below which should be kept in mind when utilizing the metrics for decision making purposes. In addition, each metric is calculated with and without other benefits.

The results for NPV, ROI, and BCR are color coded in red, yellow, and green to make it easier to see the results of the tool's calculations at one glance. One set of financial metrics (Without Other Benefits) is calculated using the data provided in sections A, B, and C in the User Input tab; another set (With Other Benefits) adds section D to its analysis.

4.3.1 Net Present Value (NPV)

The NPV of a project is the sum of the project's discounted cash flows. The EV tool calculates the net cost or benefit of a new system or system upgrade for each year within its lifecycle. The net cash inflows and outflows are discounted using the discount rate calculated in the Parameters section of the User Input tab. For the purposes of this calculation, all cash flows are assumed to occur at the end of the fiscal year.

If the sum of the discounted cash flows is positive, then the projections entered are yielding a net benefit. If the NPV is negative, the project is a net cost over its lifecycle. The NPV reflects the estimated value of the project at the current time.

4.3.2 Return on Investment (ROI)

ROI represents the ratio of net O&S savings in proportion to the net investment costs, i.e., the incremental reduction in O&S costs over the incremental investment cost. ROI is calculated by discounting future amounts at the discount rate calculated in the Parameters section of the User Input tab. If ROI is greater than 1, the discounted value of the savings is greater than discounted value of the investment costs. If a project has negative net investment (NPV of Net investment spending is less or equal to zero), this metric is invalid and a warning will appear near the metric.
NOTE: This measure is not appropriate for comparing two competing potential investments.

4.3.3 Benefit Cost Ratio (BCR)

The Benefit Cost Ratio measures the ratio of a system's benefits compared to its costs (investment and O&S). It is calculated by dividing the discounted value of the system's benefits by the discounted value of a system's costs. If the ratio is over 1, the system's benefits are greater than its costs. For discounting purposes, all cash flows are assumed to occur at the end of the fiscal year.

4.3.4 Break Even (discounted)

Break even (discounted) indicates the fiscal year in which the system achieves break even based on discounted cash flows.

Break even is the point during a system's lifecycle at which its NPV becomes positive. The calculation will only return a value if the project has a positive NPV over its lifecycle and it achieves break even exactly once. Some projects could achieve break even, but then fall back to a negative cumulative NPV due to an investment. In this case, the EV tool will return "Multiple" for the break even year. For the purposes of this calculation, all cash flows are assumed to occur at the end of the fiscal year.

4.3.5 Break Even (non-discounted)

Break even (non-discounted) indicates the fiscal year in which the system achieves break even based on non-discounted cash flows. Once again, "Multiple" may be returned as described above.

Break even (non-discounted) calculates the fiscal year in which the system will have a cumulative positive value without discounting the cash flow. This metric is also referred to as the pay-back period. Again, all cash flows are assumed to occur at the end of the fiscal year.

Appendix A – Example

An example EV Tool is seen below. The system in the example, XMPL, requires investments of $1.5 million in 2005, $1 million in 2006, and $500,000 in 2007. The O&S costs ramp up to $1.1 million in 2007 and then grow at 2% annually for the life of the project.

If XMPL were not completed, maintaining the current system would cost $2 million per year. This cost also grows at 2% per year to cover expected salary growth and inflation of other costs.

While XMPL is being built, the old system will be maintained (Phase Out Costs) at the full spend rate for 2005 and 2006. As the system reaches FOC in 2007, only $500,000 is needed to maintain the system.

Finally, because XMPL will automate some work that is currently done manually by users, $500,000 (growing @ 2%) is included in other savings (line D). This savings reflects 10 Full Time Equivalents (FTE's) that will be eliminated (and recaptured in the budget).

Parameters	
Current Fiscal Year (YYYY)	2005
FOC Year (YYYY)	2007
Discount Rate (X.XXX%)	4.333%
System Acronym	XMPL

Then Year $ in Millions	*SUNK*	2005	2006	FOC 2007	2008	2009	2010	2011	2012	2013	2014	2015
A - PROGRAM / SYSTEM IMPROVEMENT COST (do not include any status quo costs):												
A1 - Investment (Dev/Mod)	$0.000	$1.500	$1.000	$0.500	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000
A2 - Operations & Support	$0.000	$0.250	$0.750	$1.100	$1.122	$1.144	$1.167	$1.191	$1.214	$0.000	$0.000	$0.000
Total	**$0.000**	**$1.750**	**$1.750**	**$1.600**	**$1.122**	**$1.144**	**$1.167**	**$1.191**	**$1.214**	**$0.000**	**$0.000**	**$0.000**
B - STATUS QUO COSTS (total assuming NO alternative program/system improvement outlined in section "A"):												
B1 - Investment (Dev/Mod)		$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000
B2 - Operations & Support		$2.000	$2.040	$2.081	$2.122	$2.165	$2.208	$2.252	$2.297	$0.000	$0.000	$0.000
Total		**$2.000**	**$2.040**	**$2.081**	**$2.122**	**$2.165**	**$2.208**	**$2.252**	**$2.297**	**$0.000**	**$0.000**	**$0.000**
C - PHASE OUT COSTS (WITH alternative Program/System Improvement outlined in section "A"):												
C1 - Investment (Dev/Mod)		$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000
C2 - Operations & Support		$2.000	$2.040	$0.500	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000
Total		**$2.000**	**$2.040**	**$0.500**	**$0.000**	**$0.000**	**$0.000**	**$0.000**	**$0.000**	**$0.000**	**$0.000**	**$0.000**
D - OTHER COST SAVINGS (recoverable cost savings benefits not related to status quo cost reductions):												
Other Benefits		$0.000	$0.000	$0.500	$0.510	$0.520	$0.531	$0.541	$0.552	$0.000	$0.000	$0.000

Please provide detail on the "OTHER COST SAVINGS" listed above:

Once fully implemented, XMPL will reduce the amount of manual work in posting transactions to the General Ledger. The increased efficiency will lead to the reduction of 10 FTE's beginning in 2005. We estimate the average savings will be $50,000 per FTE, inflated at 2% per year.

Appendix B – Glossary

Benefit Cost Ratio (BCR) – The ratio of the system's benefits to its costs (see section 4.3.3 for greater detail)

Break-Even – The year during which a system is projected to have "paid for itself"; the year the total benefits are projected to outweigh the total costs

Cash Flow – The actual movement of money, whether an in-flow or an out-flow

Cost-benefit Analysis - A technique used to compare the various costs associated with an investment with the benefits that it proposes to return. Both tangible and intangible factors should be addressed and accounted for. [GAO]

Cost Savings – The general term describing a net decrease in expenditure

Current Fiscal Year – The fiscal year during which the analysis is being conducted; the United States Government fiscal year runs from October 1 through September 30

Discount Rate – The rate at which future cash flows are discounted; in the EV tool, this rate is calculated based on current OMB guidance

Enhancements – Any change or modification to an existing system, program, or initiative that results in improved capability or performance of the baseline activity or expansion of existing capabilities

Full Operational Capacity (FOC) – The state of development where a system can accomplish all planned tasks as has been rolled out to all planned locations

Full Time Equivalents (FTE) – Term used in the context of staffing to describe one man year, or the equivalent

Hard Dollar – Savings that can be recovered through the budget process (not to include productivity improvements or cost avoidance)

Investment (Dev/Mod) – System upgrades, refreshes, or modernizations; new systems undergoing spiral or incremental development; and single, comprehensive development efforts (see section 3.2.1 for further info)

Linear Interpolation – A method for determining an interest rate for a period not specified by the source data; this method takes the weighted average of the next shorter duration and next longer duration to determine the appropriate discount rate

Net Present Value (NPV) – the sum of the project's discounted cash flows (see section 4.3.1 for more detail)

New Starts – Systems that are not currently in operation, but planned to replace existing technology and/or add new capabilities

Nominal Discount Rate – Discount rate applied to nominal (non-inflation adjusted) cash flows

Operations and Support (O&S) – All costs to sustain the IT system after it has been released to production, including the day to day cost to manage, support, and maintain the hardware and software and to sustain system operations

Period – A standard length of time, the purposes of the EV tool, 1 year

Phase Out Costs – The expenditures required to keep the current system(s) running while the new solution is developed as well as the costs of disposing of the existing system

Program/System Improvement Costs – The costs, including both investment and operations and support, to develop and implement the preferred solution

Return on Investment (ROI) – the ratio of net O&S savings in proportion to the net investment costs, i.e., the incremental reduction in O&S costs over the incremental investment cost (see section 4.3.2 for a complete description)

Status Quo Costs – The costs (investment and O&S) required to maintain current functions and capabilities

System Change Request (SCR) – Formal request to change the requirements or functionality of a system while in development or production